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A 5-deoxyflavonol derivative in *Mimosa pudica*

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1. Subject and source

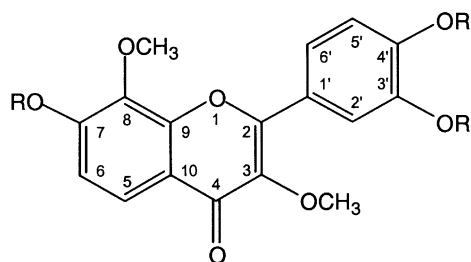
Aerial parts of *Mimosa pudica* L. (Leguminosae-Mimosoideae) were collected near Accra, Ghana. Voucher specimen (GC47684) was deposited in Herbarium GC (Ghana Herbarium, Botany Department, University of Ghana, Legon).

2. Previous work

The interest in *M. pudica* (the so-called sensitive plant) has mainly been concerned with chemistry and biology of the thigmonastic movement (rapid leaf movement observed upon touching the leaves) and nyctinastic movement (slow movement controlled by a biological clock) of the leaves, and several leaf-movement factors have been refined (Kameyama et al., 2000; Ueda and Yamamura, 2000; Ueda et al., 2000). Phenolics (Ueda et al., 2000; Josewin et al., 1999; Englert et al., 1994), norepinephrine (Applewhite, 1973) and a non-protein amino acid leucenine (mimosine) (Kleipool and Wibaut, 1950) have been isolated. A saponin (Jiang et al., 1990) and a bufadienolide (Yadava and Yadav, 2001) were reported in *M. pudica* seeds.

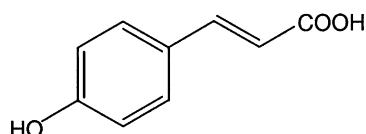
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1 R = H

2 R = COCH₃



3

3. Present study

Dried leaves of *M. pudica* (1.35 kg) were extracted with 96% ethanol (5 × 2l), the extract evaporated, and the residue distributed between MeOH–H₂O (9:1), EtOAc and light petroleum (bp 80–110 °C). The EtOAc fraction (10.7 g) was further fractionated by VLC (Merck silica gel 60H, step gradient of MeOH in CH₂Cl₂) and the product finally isolated by HPLC (250 × 4.6 mm Waters Symmetry C₁₈ column, 5 μm, linear MeCN gradient in H₂O from 5% to 95% over 25 min), to give 16 mg of 7,3',4'-trihydroxy-3,8-dimethoxyflavone (**1**). The structure could be established unambiguously using NOESY (mixing time 500–700 ms) and HMBC (delay for evolution of long-range couplings 30–100 ms) connectivities. ¹H NMR data (400 MHz, CD₃OD) δ 7.75 (1H, d, *J*_{5,6} = 8.9 Hz, H-5), 6.98 (1H, d, *J*_{5,6} = 8.9 Hz, H-6), 7.72 (1H, d, *J*_{2',6'} = 2.2 Hz, H-2'), 6.93 (1H, d, *J*_{5',6'} = 8.5 Hz, H-5'), 7.63 (1H, dd, *J*_{5',6'} = 8.5 Hz, *J*_{2',6'} = 2.2 Hz, H-6'), 3.79 (3H, s, 3-OMe), 4.01 (3H, s, 8-OMe). ¹³C NMR data (100 MHz, CD₃OD) δ 157.7 (C-2), 141.2 (C-3), 176.7 (C-4), 121.7 (C-5), 116.4 (C-6), 156.8 (C-7), 136.5 (C-8), 151.5 (C-9), 118.7 (C-10), 123.4 (C-1'), 116.5 (C-2'), 146.6 (C-3'), 149.9 (C-4'), 116.5 (C-5), 122.4 (C-6'), 60.4 (3-OMe), 62.1 (8-OMe). The compound (2 mg) was acetylated with Ac₂O/pyridine to give (**2**). ¹H NMR data (400 MHz, CD₃OD) δ 8.05 (1H, d, *J*_{5,6} = 8.7 Hz, H-5), 7.11 (1H, d, *J*_{5,6} = 8.7 Hz, H-6), 8.09 (1H, d, *J*_{2',6'} = 2.2 Hz, H-2'), 7.37 (1H, d, *J*_{5',6'} = 8.6 Hz, H-5'), 8.08 (1H, dd, *J*_{5',6'} = 8.6 Hz, *J*_{2',6'} = 2.2 Hz, H-6'), 3.93 (3H, s, 3-OMe), 4.02 (3H, s, 8-OMe), 2.34, 2.35, 2.40 (each 3H, s, OAc). The ¹H and ¹³C data of (**1**), not reported previously, are of value for reference purposes; the ¹H NMR data of (**2**) confirm the identity of (**1**) with the compound isolated from *Acacia kempeana* heartwood (Clark-Lewis and Porter, 1972). During HPLC purification of (**1**), 4 mg of *p*-coumaric acid (**3**) was isolated, the structural assignment being based on ¹H and ¹³C NMR data (Gerotheranassis et al., 1998; Nikaido et al., 1987).

4. Chemotaxonomic significance

Compound (**1**) belongs to an unusual group of flavonoids in which the oxygen at C-5 is lost during the biosynthesis (Sallaud et al., 1995). Such compounds are characteristic of the Leguminosae (Hegnauer and Grayer-Barkmeijer, 1993), where the 5-hydroxy- and the 5-deoxyflavonoids co-occur as the result of co-acting of chalcone reductase and chalcone synthase (Sallaud et al., 1995). Compound (**1**) was encountered only once before, in *Acacia kempeana* (Clark-Lewis and Porter, 1972), and represents the first report of a 5-deoxyflavonoid in *Mimosa*.

5-Deoxyflavonols with the same oxygenation level as in (**1**) have previously been isolated from many *Acacia* (Malan and Swartz, 1995; Malan, 1993; Foo, 1987; Clark-Lewis and Porter, 1972; Clark-Lewis and Nair, 1964; King and Bottomley, 1954) and several *Albizzia* species (Candy et al., 1978; Deshpande and Shastri, 1977). To the best of our knowledge, they have not been reported from other genera of Leguminosae. Thus, 5-deoxyflavonols with oxygens at C-7, C-8, C-3' and C-4' found in *Acacia*, *Albizzia* and *Mimosa* appear to be restricted to Mimosoideae.

p-Coumaric acid (**3**) is a common plant constituent. Coumaric acid derivatives act as leaf-opening substances in other nyctinastic plants (Ueda et al., 2000).

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